

APPENDIX A

FEDERAL COORDINATION AND PLANNING

BASIS FOR FEDERAL COORDINATION PROCESS

In 1963, Congress and the Executive Office of the President expressed concern about the adequacy of coordination of Federal meteorological activities. In response, Congress directed in Section 304 of Public Law 87-843--the Appropriations Act for State, Justice, Commerce, and Related Agencies--that the Bureau of the Budget prepare an annual horizontal budget for all meteorological programs in the Federal agencies.

The Bureau of the Budget (now the Office of Management and Budget) issued a report entitled "Survey of Federal Meteorological Activities" (1963). The report described each agency's program in some detail, particularly its operational services, and detailed the relationship between the programs of the various agencies. The report revealed close cooperation but little evidence of systematic coordination. Based on this study, the Bureau of the Budget issued a set of ground rules to be followed in the coordination process. It established a permanent general philosophy for assignment and assessment of agency roles in the field of meteorology and set certain goals to be achieved by the coordination process. The Bureau of the Budget tasked the Department of Commerce (DOC) to establish the coordinating mechanism in concert with the other Federal agencies. It also reaffirmed the concept of having a central agency--the DOC--responsible for providing common meteorological facilities and services and clarified the responsibilities of other agencies for providing meteorological services specific to their own needs.

The implementation of these directives by DOC led to the creation of the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) which operates with policy guidance from the Federal Committee for Meteorological Services and Supporting Research. The principal work in the coordination of meteorological activities and in the preparation and maintenance of Federal plans is accomplished by the OFCM staff with the advice and assistance of the Interdepartmental Committee for Meteorological Services and Supporting Research, and over 30 program councils, committees, working groups, and joint action groups.

MISSION AND STAFFING OF THE OFFICE OF THE FEDERAL COORDINATOR FOR METEOROLOGY (OFCM)

The mission of the OFCM is to ensure the effective use of Federal meteorological resources by leading the systematic coordination of operational weather requirements and services, and supporting research, among the Federal agencies. To discharge its mission, OFCM has meshed its objectives with the objectives of the agencies that provide the services and perform the research.

These objectives include:

- Documenting agency programs and activities in a series of national plans and reports that enable agencies to revise/adjust their individual ongoing programs and provide a means for communicating new ideas and approaches to fulfill requirements.

- Providing structure and programs to promote continuity in the development and coordination of interagency plans and procedures for meteorological services and supporting research activities.
- Preparing analyses, summaries, or evaluations of agency meteorological programs and plans that provide a factual basis for the Executive and Legislative branches to make appropriate decisions related to the allocation of funds.
- Reviewing Federal weather programs and Federal requirements for meteorological services and supporting research. This review may suggest additions or revisions to current or proposed programs, or identify opportunities for improved efficiency, reliability, or cost avoidance through coordinated actions or integrated programs.

DOC currently has ten positions assigned to OFCM. DOC also provides administrative support to OFCM and approximately one-half of OFCM's annual operating budget. The Department of Defense (DOD) currently provides two senior staff officers--one Air Force and one Navy--and contributes approximately one-fourth of the annual operating budget. The Department of Transportation (DOT) Federal Aviation Administration (FAA) provides one professional staff member and also provides approximately one-fourth of the annual operating budget. These three agency representatives are designated Assistant Federal Coordinators for liaison to their respective agencies. In all, 13 meteorologists, oceanographers, physical scientists, and administrative and computer-support personnel are assigned to the OFCM staff.

FEDERAL COMMITTEE FOR METEOROLOGICAL SERVICES AND SUPPORTING RESEARCH

The Federal Committee for Meteorological Services and Supporting Research (FCMSSR), established in 1964, provides policy-level agency representation and guidance to the Federal Coordinator to address agency priorities, requirements, and issues related to services, operations, and supporting research, and also resolves agency differences that arise during the coordination of meteorological activities and the preparation of Federal plans. The

Under Secretary of Commerce for Oceans and Atmosphere, who is also the Administrator of the National Oceanic and Atmospheric Administration (NOAA), serves as the FCMSSR Chairperson.

The 15 Federal agencies that engage in meteorological activities, or have a need for meteorological services, are represented on FCMSSR. The FCMSSR membership includes: DOC, DOD, DOT, the Departments of Agriculture (USDA), Energy (DOE),

Homeland Security (DHS), Interior (DOI), and State (DOS), the Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), National Transportation Safety Board (NTSB), Nuclear Regulatory Commission (NRC), the Office of Science and Technology Policy (OSTP), and the Office of Management and Budget (OMB).

HIGHLIGHTS FOR FISCAL YEAR 2004 AND PLANS FOR FISCAL YEAR 2005

NATURAL DISASTER REDUCTION

Interdepartmental Hurricane Conference. OFCM annually hosts the Interdepartmental Hurricane Conference (IHC) to provide a forum for the responsible Federal agencies, together with representatives of the user communities such as emergency management, to review the Nation's hurricane forecast and warning program and to make recommendations on how to improve the program in the future. OFCM conducted the 58th Interdepartmental Hurricane Conference (IHC) in Charleston, South Carolina, March 1-5, 2004. The theme of the conference was *Hugo to Isabel: 15 Years of Progress Plus Momentum for the Future*. The conference attendance was 216; for the fifth consecutive year, attendance has exceeded 200. The principal objectives of the conference were to: review the Nation's hurricane warning program, highlighting both the advances made since Hurricane Hugo and future challenges; evaluate lessons learned from the 2003 hurricane season, with a focus on Hurricane Isabel, and update the *National Hurricane Operations Plan* for 2004; examine the impacts of tropical cyclone hazards, such as storm surge, and begin to assess the socioe-

conomic/cost avoidance aspects of tropical cyclone forecasts and warnings; evaluate the Joint Hurricane Testbed (JHT) as a model for transitioning successful research results into operations; and develop the framework for a comprehensive R&D plan which documents and prioritizes research needs based on operational needs and requirements. The keynote address was presented by the Honorable Michael D. Brown, Undersecretary for Emergency Preparedness and Response, Department of Homeland Security. He praised the support provided by NOAA and the Federal meteorological community as instrumental in minimizing the loss of life and damage to property each year from hurricanes and other tropical storms. In May 2004, the OFCM published the 42nd edition of the *National Hurricane Operations Plan* (NHOP), which documents the new procedures, procedural changes, and agreements reached at the IHC.

Several major accomplishments that have resulted from specific action items that were brought to the IHC or have been achieved through the partnership arrangements facilitated by the IHC include: implementation of the 5-day hurricane forecast; development of

the Stepped Frequency Microwave Radiometer (SFMR); improved capability because of use of Global Positioning System dropwindsondes; improved hurricane modeling and prediction; increased focus on inland flooding; the successful partnering with the Federal Emergency Management Agency through the Hurricane Liaison Team; improved preparedness, response and outreach to the public through Hurricane Awareness Week; support to the Joint Hurricane Testbed; partnership between IHC and The Weather Channel; and increased outreach to other Federal agencies. A key action item from this year's IHC is preparation of a comprehensive hurricane R&D plan to document and prioritize research needs based on operational needs and requirements. Use of SFMR surface winds had an immediate impact on analyses for Hurricane Frances in September 2004. The SFMR surface winds showed that the radius of 34 knot and 50 knot winds had increased from the previous observations by a significant amount, necessitating the extension of warnings further north along the Florida east coast. Further, analysis of the SFMR data showed that, while the peak eyewall

winds had not increased, a shift in the hurricane force winds occurred from east of center at the previous analysis time 6 hours earlier to north and north-west of the center; i.e., toward the landward side of Frances. This OFCM-sponsored development effort is beginning to pay big dividends. The next task is to transition the SFMR technology to the operational fleet of WC-130J aircraft flown by the Air Force Reserve Command's 53rd Weather Reconnaissance Squadron-the Hurricane Hunters.

National Hurricane Conference. OFCM participated in the 26th Annual National Hurricane Conference (NHC) in Lake Buena Vista, Florida, April 5-9, 2004. The NHC is the Nation's forum for education and professional training in hurricane preparedness. The primary goal of the NHC is to improve hurricane preparedness, response, recovery, and mitigation in order to save lives and property in the U.S. and the tropical islands of the Caribbean and the Pacific. In addition, the conference serves as a national forum for Federal, state, and local officials to exchange ideas and recommend new policies to improve emergency management. On April 6, OFCM conducted a training session in connection with the conference. The training session was entitled "Information Dissemination Technologies and Architecture--Meeting the Growing Needs and Demands on Users and the Public." It follows from an ongoing action from the FCMSSR to develop a strategy for atmospheric information. The objectives of the training session were to (1) examine the current and future policy and available information dissemination technologies (IDT) and architecture for use in the dissemination of environmental (weather and climate) information to the emergency management community and the public; and (2) to acquire feedback from attendees on how the emergency management community (especially deci-

sion makers and first responders) views current and planned resources and identify any unmet needs of the emergency management/responder community. Approximately 100 conference attendees participated in the session's two panel discussions. Panel I examined current and future policy and available IDT and architecture for disseminating environmental (weather and climate) information to the emergency management community and the public. Panel II discussed ways to raise awareness of decision-makers and emergency responders regarding new, improved, or emerging tools and technology to disseminate critical all-hazards information to the public, especially information on hurricanes and inland flooding.

The two panels provided a useful first opportunity to test the Natural Hazard Warning User questionnaire with a pool of IDT users. The combination of IDT users affiliated with state, local, or volunteer affiliations is of particular interest because most of these individuals are directly involved in responding to natural hazard and other emergency incidents. Most of the IDT users completing the questionnaire came from states along the Atlantic and Gulf coasts. As will be seen, the types of natural hazard warnings they use most often reflect hazards typical of this region. Findings based on this first administration of the questionnaire must be considered tentative and suggestive because of the small number of IDT users and the self selection bias introduced by (a) their participation in a special interest conference and (b) voluntary completion of the questionnaire. As one would expect from the nature of the conference and the regional distribution of the IDT users, hurricane and tropical storm were the most used warning types. The high response for tornado warnings suggests that education, training, and outreach (ETO) on hurricane/tropical storm hazards and the

importance of tornado watches and warnings have been effective. By comparison, the flood related warning types (flood, flash flood, and coastal flood) are used by fewer of the IDT users, despite the serious risk of flooding hazards to any area in the path of a major hurricane or tropical storm. Given that flooding has each year been one of the top two or three natural hazards when ranked by number of deaths, this may be an area for ETO emphasis. Among the IDT users, graphical formats are used as much as alphanumeric formats. Voice, image, and sounds/tones are also used by many of these IDT users. Not surprisingly, television (both broadcast and cable) and commercial radio (AM/FM) are broadcast technologies on which these IDT users rely heavily. Good news is that NOAA Weather Radio is also used by most of the IDT users. Internet websites are also being used for warning information by most of the IDT users. Another interesting point is that, among these IDT users, cell phones appear to be used somewhat more than wired telephones at home or at work. Pagers are still important for IDT users in local emergency response/management organizations. The Emergency Alert System (EAS) is also broadly in use as an IDT by this group. Even in this small pool of IDT users, we found some infiltration of new IDT technologies such as Voice over internet protocol (VOIP), DSRC, reverse 911, and wireless Internet. Nearly all of the IDT users have access to their warning service available around the clock. And nearly all are using a free warning service, rather than a fee for service option. Rural commuting was the situation most frequently identified as giving these IDT users the most difficulty in receiving warning information. In vehicle IDT options are an area for further assessment in user responses and, potentially, an R&D and implementation focus. An alarming number of the IDT users cited reception difficulties

inside public and government buildings—even more than private or commercial buildings. Many IDT users routinely work in or frequently visit public and government buildings. Difficulty in receiving timely warnings in these locations could impede their ability to respond. If additional IDT user data confirm this to be an issue, it may warrant investigation into the kinds of reception difficulties being experienced and the potential solutions.

Post-Storm Data Acquisition. Work is being done to implement a new interagency agreement which will permit the U.S. Air Force Auxiliary to continue to support the OFCM-sponsored Working Group for Natural Disaster Reduction/Post-Storm Data Acquisition (WG/NDR/PSDA) in its mission to coordinate data acquisition efforts following natural disasters. This agreement will also be the framework for use by other NOAA entities as needs arise; e.g., support during wildfires and monitoring whale migration. In the interim OFCM coordinated an agreement with the U.S. Air Force Auxiliary, through the Secretary of the Air Force, for military support for post-storm data acquisition through the end of the 2004 hurricane season. These post-storm efforts contribute to the determination of the intensity and magnitude of storms, and, in many cases, help to determine the extent of damage for use in Presidential disaster declarations. The additional data collected after hurricane landfall is also used in validating modeling efforts with both emergency management models (e.g., FEMA's HAZUS) and hurricane storm-surge models (e.g., NOAA's SLOSH). These models are used in real-time to assist decision makers in evacuation decisions and procedures. Post-storm data are also used to update FEMA Flood Insurance Rate Maps. During FY 2004, the coordinating efforts provided support to Hurricanes Charley, Frances, Ivan and Jeanne, and two F4 tornado damage

surveys during May, in Harper County, Kansas, and in Lancaster County, Nebraska.

USER FORUM ON URBAN METEOROLOGY

OFCM, in partnership with the Department of Homeland Security (DHS) Science and Technology Directorate, conducted a User Forum on Urban Meteorology September 21-23, 2004, at the Doubletree Hotel and Executive Meeting Center in Rockville, Maryland. The theme of the forum was *Information to Improve Community Responses to Urban Atmospheric Hazards, Weather Events, and Climate*. It focused on the following elements of urban meteorology: severe weather, homeland security, air quality, water quality, and climate. This interagency forum was the direct result of an action item from the October 18, 2002, meeting of the FCMSSR and, also, follows from the 7th Annual George Mason University (GMU) Transport and Dispersion Modeling Conference (June 17-18, 2003) and the 8th Annual GMU Conference (July 13-15, 2004). The forum's agenda included key presentations at the beginning and end of the forum, five plenary session panels, and six workshop sessions scheduled in pairs. The forum's objectives were to: reduce high impact weather and climate risks and improve the quality of life in urban areas; increase understanding and facilitate the transfer of emerging science and technology to meet today's urban weather and climate challenges; improve forecasting in coastal areas and areas with complex terrain; and set the stage for building user-tailored decision support systems for real-time response to the spectrum of hazardous weather events and atmospheric conditions. The subject of this forum is extremely important since nearly two-thirds of the U.S. population lives in urban areas occupying less than two percent of the U.S. landmass,

and America's vulnerability to severe weather and hazards related to air quality, water quality, atmospheric dispersion of dangerous materials, and climatic variations are rising as the urban proportion of the population increases. The User Forum on Urban Meteorology supports NOAA's goals related to coastal and ocean resources, climate, weather and water information, homeland security, and commerce.

OPERATIONAL PROCESSING

The spring 2004 meeting of the OFCM Committee for Operational Processing Centers (COPC) took place at the Air Force Weather Agency in Omaha, Nebraska, from March 31-April 1, 2004. The focus of the meeting was on the Weather Research and Forecasting (WRF) community model and how to facilitate the exchange of data and information among the WRF Operational Test Centers (OTC). The major goals and issues of the meeting dealt with information technology collaboration, grid computing, and architectural issues; establishment of priorities for the Joint Action Group for Operational Community Modeling (JAG/OCM); the WRF Concept of Operations; WRF Operational Test Center procedures; and a combined strategy for future year budget requests. The major accomplishment of the meeting was finalizing and signing on April 1, 2004, of the *National Concept of Operations Framework for the Operational Processing Centers* to guide the implementation of WRF--the next-generation numerical weather prediction model. Another significant accomplishment was the publication of the *Catastrophic Backup Action Plan* (CBAP) for the operational processing centers (OPC) in July 2004. The purpose of the CBAP is to identify catastrophic backup shortfalls that exist at the Nation's military and civilian meteorological, oceanographic, and satellite OPCs that can be addressed in the short term. With respect to the plan,

"catastrophic" means a total incapacitation of an OPC for an extended period of time. "Short term" means months--that which can be accomplished with a minimum of already available resources. The CBAP identified 10 shortfalls. Plans to address each of the shortfalls have been developed. For six of the shortfalls, implementation activities have been accomplished. That is, the tasks needed to establish backup capabilities are finished and the resources needed to establish backup capabilities are available. COPC activities relate to the crosscutting area of homeland security in addition to NOAA's goal to serve society's needs for weather and water information.

ENVIRONMENTAL SUPPORT TO HOMELAND SECURITY

George Mason University Transport and Dispersion Modeling Conference. George Mason University (GMU), Fairfax, Virginia, conducted its 8th Annual Conference on Transport and Dispersion Modeling, July 13-15, 2004. The OFCM partnered with the Defense Threat Reduction Agency (DTRA) and GMU to sponsor the event. The major topic areas for the conference were: new developments in basic theories of boundary layer models and transport and dispersion models; urban-scale meteorological and dispersion experiments and models; computational fluid dynamics (CFD) model theory and applications; field experiments and laboratory experiments concerned with boundary layer studies and turbulence and dispersion studies; mesoscale meteorological modeling for input to transport and dispersion models; the use of remote sensing technology in boundary layer and transport and dispersion studies; model evaluation methods, uncertainty/sensitivity analyses, and risk assessments; improvements in model inputs (e.g., land-use data, 3-D building data) and output visualiza-

tions; and methods and criteria for emergency response and decision-making. There was also a special session on the Joint Urban 2003 Field Experiment, the DTRA/DOE-sponsored Oklahoma City Field Exercise which occurred in Oklahoma City from June 28 - July 31, 2003.

On July 14, 2004, OFCM hosted a session related to OFCM's ongoing work with the Department of Homeland Security and other members of the Federal meteorological community to define the concept of operations and the research and development needs required to support the National Incident Management System and emergency responders at Federal, state, and local levels. The objectives of the OFCM session were twofold: (1) to inform attendees regarding the Interagency Modeling and Atmospheric Assessment Center (IMAAC) and the role the Federal agencies will play in the development of the IMAAC, and (2) to present the draft Federal ATD R&D Plan, *Federal Research and Development Needs and Priorities for Atmospheric Transport and Diffusion Modeling*, and solicit comments, feedback, and discussion from the conference attendees. The OFCM session included two invited presentations and a panel discussion. As follow-on actions, the OFCM will continue to work with the Department of Homeland Security/Science and Technology Directorate (DHS/S&T) to develop the implementation plan and concept of operations for the IMAAC, integrating the responsibilities and capabilities that all the Federal agencies bring to the table. The Federal ATD R&D Plan will be presented to the Interdepartmental Committee for Meteorological Services and Supporting Research (ICMSSR) for approval in the fall, following the presentation to the OFCM/DHS jointly sponsored Urban Meteorology User Forum, which will be conducted September 21-23, 2004, to provide the

private and academic sectors an opportunity to further discuss with members of the public sector the Federal research and development needs and priorities for atmospheric transport and diffusion modeling.

Homeland Security Environmental Support Plan. Work is ongoing to complete the interagency *Homeland Security Environmental Support Plan*--an action from the FCMSSR. The plan defines the mission, roles, and responsibilities of individual Federal agencies as they relate to homeland security and documents each agency's environmental support capabilities and/or requirements. The OFCM is currently working closely with the Plume Modeling Subset of the Consequence Management, Site Restoration/Cleanup (CMS) Subgroup, which is chaired by the Department of Homeland Security (Emergency Preparedness and Response), to develop an interagency concept of operations for an all-hazards dispersion support framework. The concept of the Interagency Modeling and Atmospheric Assessment Center (IMAAC) was successfully proposed to the Homeland Security Council Deputies in April 2004. The Department of Homeland Security/Science and Technology Directorate (DHS/S&T) then started developing the IMAAC implementation plan and concept of operations in partnership with DOD, DOE, EPA, NOAA, NRC, NASA, and OFCM. Once it evolves, the concept of operations for the IMAAC will be an integral part of the *Homeland Security Environmental Support Plan*, which should be ready for publication in fall 2004. The intended audience for this document includes the Federal agencies involved in crisis and consequence management, and state and local (e.g., city, county, and parish) governments and their first-responder organizations.

Federal Atmospheric Transport and Diffusion Research and Development Plan. An interagency joint action

group (JAG) was formed and activity is underway to develop an integrated research and development plan to support the atmospheric transport and diffusion modeling needs and activities of the Federal agencies in support of the Department of Homeland Security--an action from the FCMSSR. The plan will identify the research and technical needs required to enhance Federal atmospheric transport and diffusion (ATD) modeling. Input to the plan will include: *Atmospheric Modeling of Releases from Weapons of Mass Destruction--Response by Federal Agencies in Support of Homeland Security* (OFCM); *Tracking and Predicting Atmospheric Dispersion of Hazardous Material Releases, Implications for Homeland Security* (NRC); and the OFCM special sessions of the 7th Annual GMU Conference on Transport and Dispersion Modeling (June 2003) and 8th Annual GMU Conference (July 2004). The JAG conducted a gap analysis and consulted with subject-matter experts; listed and prioritized R&D needs; developed research and advanced development strategies; and developed a framework for transitioning successful research results into operations through interagency cooperative efforts like observational and modeling test beds, field and urban studies/experiments, and a common model evaluation methodology. The plan prioritizes the most pressing needs based on stated operational shortfalls and provides a roadmap to address those needs within the OFCM coordinating infrastructure. As discussed above, the initial draft plan was vetted through the 8th Annual GMU Transport and Dispersion Modeling Conference in July 2004. Then following the presentation to the September 2004 Urban Meteorology Forum, the plan will be presented to the ICMSSR in the fall for its responses and actions to the recommendations. The expected completion date is October 2004.

ANNUAL FEDERAL PLAN

In November 2003, OFCM issued *The Federal Plan for Meteorological Services and Supporting Research--Fiscal Year 2004*. The Federal Plan is Congressionally mandated and is a one-of-a-kind document which articulates the meteorological services provided and supporting research conducted by agencies of the Federal government. The Federal Plan helps to reduce duplication among the agencies. It is a comprehensive publication that documents proposed programs for Fiscal Year 2004 and reviews agency programs in Fiscal Year 2003. The Plan demonstrates to the Congress, and to the Executive Branch, how the Federal agencies work together to accomplish their missions in an effective and efficient manner. The special interest article for this year's plan was *Weather and the Urban Environment: Meeting the Needs of Urban Communities*. The article lists five areas of concern related to urban weather (air quality, water quality, severe weather, disaster response and homeland security, and climate change), and includes information on applications for urban meteorology, tools needed to support applications, and key players and their roles. On March 12, 2004, OFCM issued a call to the agencies for input to *The Federal Plan for Meteorological Services and Supporting Research--Fiscal Year 2005*. The call for input included a guidance package which describes the procedures, budget categories, and formats for providing agency input. It also included milestones for submitting FY 2005 inputs to lead to an October 1, 2004, plan distribution. The feature article of the FY 2005 Annual Federal Plan entitled *The Rewards of Managing Weather-Related Risks* will focus on the Federal agencies' meteorological activities related to risk management and assessments, and the socioeconomic impacts of natural hazards.

WEATHER INFORMATION FOR SURFACE TRANSPORTATION

OFCM published the *Weather Information for Surface Transportation-National Needs Assessment Report* in December 2002. The WIST Report sets the stage for revolutionary improvement in the way weather information is applied to surface transportation across the Nation. It establishes a process that involves decision makers throughout the public and private sectors, academia, and industry in a collaborative effort to define weather information needs and recommends next steps to incorporate current and future results from science and technology innovations into surface transportation activities that bear on the safety and economic welfare of all citizens. The WIST Report is the product of an extensive 3-year interagency effort and is a historic achievement from the standpoint that it is the first-ever compilation of weather support needs across the six surface transportation sectors: roadway, railway, transit, marine transportation, pipeline systems, and airport ground operations. This activity included the formation of a joint action group to address meteorological requirements for surface transportation; questionnaires; surveys; WIST symposia conducted jointly by the Office of the Federal Coordinator for Meteorology and the Federal Highway Administration; meetings with railroad, pipeline, and emergency managers; and participation on panels concerning public-private partnerships in transportation and Intelligent Transportation Systems. The report makes clear that by meeting the requirements for provision of weather information for surface transportation to users, we can often increase safety and realize economic benefits at the same time.

The *Weather Information for Surface Transportation-National Needs Assessment Report* has led to a great

deal of activity in this new and important area of meteorological support.

- On August 18, 2003, Ms. Mary E. Peters, Administrator of the Department of Transportation/Federal Highway Administration (FHWA), and VADM Conrad C. Lautenbacher, Jr., USN (Ret.), Under Secretary of Commerce for Oceans and Atmosphere and Administrator of the National Oceanic and Atmospheric Administration (NOAA), met to begin a dialog regarding the next steps to take in the area of Weather Information for Surface Transportation (WIST). Ms. Peters indicated that the WIST Report documented not just FHWA needs, but all of DOT's requirements, and she wanted to begin discussions with NOAA senior leadership on how NOAA and FHWA could work together to meet those needs and requirements. The FHWA's first concern is enhancing roadway safety, followed by improving efficient transportation regardless of the weather conditions experienced by surface transportation operators. Weather is a major economic factor. At least \$1 trillion of our economy is weather-sensitive, as goods and services move through our Nation's transportation systems.

- Subsequently, OFCM hosted a NOAA-FHWA meeting on October 24, 2003, to discuss strategy and plans for near-term, intermediate-term, and long-term activities for WIST.

- OFCM worked with AMS senior leadership to help structure the AMS Policy Forum on "Highways and Weather" held on November 4-5, 2003, where the Federal Coordinator played a key speaking role to set the tone and direction of the forum.

- OFCM provided VADM Lautenbacher a status report on November 6, 2003, concerning NOAA and FHWA staff activities to meet the WIST-related tasks laid out during the August 18, 2003, NOAA-FHWA meeting.

- NOAA senior leadership support the incorporation of WIST as a pro-

gram element under NOAA Strategic Plan Goal #4 (Commerce and Transportation) on November 17, 2003, by issuing guidance that the NOAA Commerce and Transportation Program Plan should support and be "consistent with Weather Information for Surface Transportation (WIST) demonstration and pilot projects."

- OFCM made several, specific inputs to the NOAA Strategic Plan Goal Team #4's R&D proposal (NOAA Research and Development Plan For Safe and Efficient Surface Transportation) developed in late November and early December 2003, in support of the NOAA leadership guidance to include WIST in the Commerce and Transportation Program Plan. This proposal was approved by the Deputy Under Secretary of Commerce for Oceans and Atmosphere.

- OFCM provided a foundation-laying WIST briefing to the National Academy of Sciences' Board on Atmospheric Sciences and Climate (BASC) and Transportation Research Board (TRB) as they began to develop the report *Where the Weather Meets the Road--A Research Agenda for Improving Road Weather Services*, which was released on January 16, 2004. The BASC report endorses the WIST Report results and calls for the Federal government to establish a multiyear national road weather research program, led by the FHWA, to bring together the weather and surface transportation research communities. The report also calls for the development of an overarching, multiagency-coordinated WIST implementation program.

- Another NOAA-FHWA WIST meeting was held February 19, 2004. The purpose of the meeting was to further discuss and develop a detailed, proposed set of near-term pilot projects that would help NOAA and FHWA begin to implement the WIST Report recommendations in the operational and research areas and document

results of these joint efforts.

- OFCM participated in the AMS 2004 Corporate Forum which was held March 14-16, 2004. The forum focused on the themes of earth observations, public-private-academic partnerships in the weather and climate enterprise, and road weather. The Federal Coordinator briefed the Corporate Forum on *The WIST Report and the Road Ahead*.

- OFCM participated in the AMS and National Academies Congressional Briefing, *Weather and Our Nation's Roads: The Need for a Coordinated Road Weather Research Program*, March 17, 2004. Topics discussed included application of weather information to road safety and efficiency, a research agenda for improving road weather services, and perspectives from the state and local level.

- NOAA and FHWA personnel also met on March 19, March 25, March 30, and April 9, 2004, to work on a NOAA/FHWA Partnering Plan to lay the groundwork to achieve their shared goals for a safer and more efficient surface transportation system. The first iteration of the Partnership Plan groups initiatives into five categories: Training, Observations, Numerical Weather Prediction, Databases/Decision Support, and Information Dissemination.

- Weather Information for Surface Transportation was briefed and discussed at the May 14, 2004, meeting of the ICMSSR. Actions which came out of the ICMSSR meeting include: (1) Complete development of the NOAA/FHWA Partnering Plan, covering road weather needs, as a first step in showing progress on WIST needs; (2) OFCM establish a Working Group for WIST (WG/WIST), led by FHWA and NOAA, to allow all Federal departments and agencies to participate in the development of plans or projects to meet their WIST needs and ensure Federal resources are used efficiently; (3) WG/WIST develop a mul-

tiyear, Federal WIST research program plan to bring together the Federal weather and surface transportation research communities and provide a vision for the public and private sectors to use for planning purposes; and (4) WG/WIST develop an overarching, Federal, multiagency-coordinated WIST implementation program.

- OFCM participated in the 1st Surface Transportation Weather Workshop at the University of North Dakota, August 11-12, 2004. The workshop was cosponsored by the University of North Dakota Surface Transportation Weather Research Center and FHWA. A senior OFCM staff person addressed the workshop during its session on *Converting a National Vision into Reality*.

- An ad hoc WIST Executive group met on August 26, 2004, to review progress on the NOAA-FHWA Partnering Plan, a draft NOAA-FHWA MOU, and to receive an activities update briefing from NOAA's Surface Weather Program Manager. It was discussed that the NOAA-FHWA Partnering Plan should be restructured to concentrate on "NOAA's responsibility for protecting life and property and enhancing the national economy. The NOAA Surface Weather Program should stress its support of public safety, and its commitment to support the Nation's commerce with information for safe, efficient, and environmentally sound transportation (NOAA's Commerce and Transportation Strategic Goal)."

AVIATION WEATHER

In December 2003, OFCM issued an update to the *2001 Aviation Weather Program Baseline Report*. This is part of the continued implementation of the *National Aviation Weather Program Strategic Plan* and the *National Aviation Weather Initiatives*. The update is an inventory of over 150 programs/projects in aviation weather and represents nearly a doubling of the

number of programs/projects in the 2001 report; a preliminary summary of the inventory was included in the *National Aviation Weather Program Mid-Course Assessment* which was published in August 2003. The update is a snapshot of work underway in both the Federal agencies and the private sector and includes a mapping of the programs/projects against the National Aviation Weather Initiatives. The update shows that most of the initiatives are being worked by one or more agency programs, but it also cautions that the agencies must remain vigilant for possible duplication. Furthermore, the programs/projects outlined represent a fairly complete inventory of work being done in the aviation community to reduce accidents and delays where weather is a contributing factor. Accident statistics are showing that fatal accident rates involving weather are declining, and it is believed that the R&D efforts, as well as the other work highlighted in this updated report, are contributing to this decrease. OFCM conducted a Panel Session on the National Aviation Weather Initiatives at the National Business Aviation Association, Inc. and Friends and Partners in Aviation Weather Annual Meeting held in Orlando, Florida, in October 2003, and provided an update on implementation of the National Aviation Weather Program at the National Weather Association 28th Annual Meeting in Jacksonville, Florida, October 18-23, 2003.

From June 21-24, 2004, the OFCM hosted the *2nd International Conference on Volcanic Ash and Aviation Safety* at the Hilton Alexandria Mark Center Hotel, Alexandria, Virginia. The theme of the conference was *Avoiding Airborne Volcanic Ash--Anywhere in the World*, and its overall goal was to enhance mitigation capabilities worldwide by providing an international forum for the exchange of technical, operational, and scientific information. Attendees

represented airlines (meteorology departments, dispatch, pilots), aviation manufacturers, airport authorities, governmental and nongovernmental organizations, volcano observatories, Volcanic Ash Advisory Centers, academia, and the scientific press. Total conference attendance was 226 persons; 21 nations and 15 airlines were represented. The conference was very successful. Information collected from conference attendees will ensure that the four conference expectations will be achieved. These are (1) identify new operational needs/requirements and the research and development needed to satisfy those requirements, (2) where possible, match operational and research and development needs/requirements to ongoing programs/projects to maximize partnership efforts, (3) develop a roadmap for improved volcanic ash-related education, training, outreach, and decision tools, and (4) develop a framework for improved partnerships within the international volcanic ash community to leverage resources and capabilities across the spectrum of operations and research and development. The conference generated a number of action items and recommendations which the OFCM Working Group for Volcanic Ash (WG/VA) was tasked to address. Specifically, the WG/VA will (1) seek further help, input and advice from international partners and the International Civil Aviation Organization; (2) sort action items and recommendations into short- (0-12 month), mid- (1-4 year), and long-term (4-10 year) actions and prioritize them; and (3) develop and gain approval of a Volcanic Ash Implementation Plan. The plan will detail program goals; operational needs/requirements; R&D needs and priorities; a roadmap for improved volcanic ash-related education, training, outreach, and decision tools; and a framework for improved partnerships within the international volcanic ash community to leverage

resources and capabilities across the spectrum of operations and research and development within the next 12 months. A summary of the conference outcomes was issued in July 2004. One example, and a timely reminder, of why the Volcanic Ash Conference is so relevant, is the seismic activity and releases of steam and volcanic ash from Mount St. Helens in Washington beginning September 23, 2004, and the possibility of a blast of ash that will rise tens of thousands of feet and drift with the wind.

SPACE WEATHER

Space weather refers to conditions on the Sun and in the solar wind, magnetosphere, ionosphere, and thermosphere that can influence the performance and reliability of space-borne and ground-based technological systems, and can endanger human life or health. Space weather storms can cause disruption of satellites, communications, navigation, and electric power distribution grids. The overarching goal of the National Space Weather Program (NSWP), which is administered by an OFCM program council, is to achieve an active, synergistic, interagency system to provide timely, accurate, and reliable space weather warnings, observations, specifications, and forecasts by 2007. The NSWP Strategic and Implementation Plans provide, respectively, broad guidance and a detailed roadmap for the NSWP.

In the first quarter of FY04, OFCM led the development of a report on the *Importance of the National Oceanic and Atmospheric Administration's Space Environment Center (NOAA/SEC) to the National Space Weather Program (NSWP)*, in response to continuing Congressional budget pressures being experienced by NOAA/SEC and concerns expressed by the NSWPC and the CSW. The report outlined the many key benefits provided by NOAA/SEC to the multi-agency NSWP. The report also

detailed the negative impacts that would result from insufficient funding at SEC with regard to the Nation's ability to observe, predict, and warn of impending solar activity and the resultant impacts on the Nation's technical systems and human life or health. This report was endorsed to the Office of Science and Technology Policy (OSTP) by the Under Secretary and FCMSSR Chairman. In November 2003, in a message from OSTP to Congressional staff, Dr. John H. Marburger, III, OSTP Director, supported the full funding of SEC. While not totally successful, this effort did garner enough Congressional support to fund NOAA/SEC in FY04 at 65 percent of their budget request.

OFCM took part in Space Weather Week at NOAA's Space Environment Center, Boulder, Colorado, April 13-16, 2004. The conference highlighted recent space weather impacts in several areas of the environment, including airline problems, GPS and ionospheric disturbances, satellite drag, and geomagnetic storms.

Work is underway to conduct the next meeting of the Committee for Space Weather (CSW) in October 2004 and planning has begun for the next meeting of the National Space Weather Program Council (NSWPC).

LIGHTNING DATA USER REQUIREMENTS

The OFCM Joint Action Group for Lightning Detection Systems (JAG/LDS) continues to be involved with source selection activities for the new lightning data contract scheduled for FY 2005. Proposals were received in early July of 2004, and JAG/LDS members are serving as members of the Technical Evaluation and Business Committees. Technical and cost evaluations are ongoing, with the goal of contract award by the end of September 2004. The new contract will be for one base year and four one-year options.

TEMPERATURE INDICES

OFCM's Joint Action Group for Temperature Indices (JAG/TI) continued to monitor the progress of the World Meteorological Organization Commission for Climatology work on the development of the Universal Thermal Climate Index (UTCI). This index is for the thermophysiological relevant assessments of the atmospheric environment for human health and well-being related to such applications as daily forecasts, warnings (e.g., wind chill, Heat-Health Warnings System), bioclimate mapping, urban and regional planning, environmental epidemiology, and climate impact research. The guidelines for a UTCI are due to be available in late 2005. The JAG/TI will coordinate as needed to implement the UTCI across the U.S. Federal agencies and with our partners in Canada.

PHASED ARRAY WEATHER RADAR PROJECT

OFCM hosted a Phased Array Weather Radar Project (PAWRP) meeting on July 22, 2003, attended by six Federal departments and agencies to explore expanded agency participation in the project. This meeting was held in response to actions of the last meeting of the FCMSSR (October 18, 2002) and the ICMSSR (April 30, 2003). The FCMSSR and ICMSSR directed the Federal Coordinator to determine specific needs of the agencies, show benefits of the Phased Array Radar (PAR) capability for their respective agencies, and explore opportunities for expanded agency participation in the PAWRP.

OFCM arranged for a January 29, 2004, visit to the National Severe Storms Laboratory (NSSL) by representatives from three Federal agencies to learn more about PAR technology and how it might benefit their organizations. NSSL has a phased array radar provided by the Navy for research purposes. The participants were briefed on PAR technology, and

the resultant discussion answered agency questions concerning how the PAR technology might meet agency requirements, what period of time might be needed for the required PAR R&D to be accomplished before an operational system could be developed and fielded, and what other advancements (e.g., improved data assimilation, improved forecast models) would be needed in addition a PAR system to go from "warn on detection" to "warn on forecast and detection." It was also briefed that the PAR will be ready for R&D efforts beginning March 2004. Additionally, based on knowledge gained at the July 2003 meeting, and a subsequent visit to NSSL in January 2004, OFCM will begin work with the Federal agencies to form a Joint Action Group that would identify the potential needs and benefits of the agencies that PAR and Networked Radars (NETRAD) would address, develop a PAR R&D plan that would focus R&D efforts on meeting agency needs, and developing a funding proposal to support the required PAR R&D.

The PAWRP was briefed and discussed at the May 14, 2004, meeting of the ICMSSR. Actions which came out of the ICMSSR meeting include: (1) OFCM work with the Federal agencies to form a Joint Action Group for Phased Array Weather Radar Project (JAG/PAWRP) of stakeholder agencies; (2) JAG/PAWRP identify and document the potential needs and benefits of the agencies that phased array radar and an adaptive radar sensing strategy would address; and (3) JAG/PAWRP integrate those identified needs into a multiagency coordinated R&D plan that would focus efforts on meeting agency needs.

COLLABORATION WITH NAS/NRC BOARD ON ATMOSPHERIC SCIENCES AND CLIMATE

OFCM continued its mutually beneficial interactions with the National

Academy of Sciences/National Research Council (NAS/NRC). The NAS/NRC Board on Atmospheric Sciences and Climate (BASC) recently formed a "Committee on Weather Research for Surface Transportation: The Roadway Environment." The Committee conducted a study to examine the research opportunities and required services needed to support improved weather forecasting for the Nation's roadways. It investigated the current state of knowledge regarding forecasting of road weather conditions, recommended key areas of research to enhance operational weather forecasts for roads, and identified possible agency and infrastructure requirements to best provide this information to users.

At its first meeting held February 20-21, 2003, in Washington, D.C., the Federal Coordinator addressed the Committee regarding the roadway transportation aspects of OFCM's *Weather Information for Surface Transportation-National Needs Assessment Report* and, more generally, about the Federal context for meteorological research relevant to surface transportation. Copies of the WIST Report were also provided to the Committee members to assist the BASC study. The Federal Coordinator also addressed BASC at its planning retreat June 30 - July 2, 2003, in Woods Hole, Massachusetts, in the portion of the retreat dealing with how BASC could be more effective; lessons from past BASC studies; and how BASC could improve, expand, and address new audiences.

The BASC report, *Where the Weather Meets the Road--A Research Agenda for Improving Road Weather Services*, was released on January 16, 2004. The study stressed not just research opportunities but, also, how to make this information useful for improved operations and implementation. The study provides a framework and recommendations to engage the transportation and weather communi-

ties (and other stakeholders) in the development of a strategic plan to guide road weather research.

OFCM also participated in the AMS and National Academies Congressional Briefing, *Weather and Our Nation's Roads: The Need for a Coordinated Road Weather Research Program*, March 17, 2004. Topics discussed included application of weather information to road safety and efficiency, a research agenda for improving road weather services, and perspectives from the state and local level. The Federal Coordinator also participated in the BASC Summer Study July 12-13, 2004, in Woods Hole, Massachusetts, the subject of which was *Challenges in Representing Physical Processes in Coupled Atmosphere-Land-Ocean Models: A Workshop*.

COLLABORATION WITH THE U.S. WEATHER RESEARCH PROGRAM

The mission of the U.S. Weather Research Program (USWRP) is to accelerate forecast improvements of high impact weather and facilitate full use of advanced weather information. The program's vision is to mitigate the effects of weather-induced disasters; reduce the costs associated with routinely disruptive weather; create opportunities for increased productivity through better weather information; and assist the military in the accomplishment of its mission. The current USWRP team includes NOAA as the lead agency, NSF, NASA, the U.S. Air Force, and the U.S. Navy. The Federal Coordinator has contacted additional agencies to broaden Federal participation in the USWRP in accordance with an action from the ICMSSR, direction from the Chairman of the FCMSSR, and a recommendation from the National Academy of Sciences/National Research Council Board on Atmospheric Sciences and Climate (BASC). The additional agencies included Federal Aviation

Administration (FAA), Federal Highway Administration (FHWA), Department of Energy (DOE), United States Department of Agriculture (USDA), and the Environmental Protection Agency (EPA). This has led to more interaction directly between the leadership of the USWRP and interested agencies to discuss in more detail agency-specific needs which may benefit from the Program. The USWRP is represented on the OFCM's Committee for Cooperative Research and an OFCM representative attends USWRP-related meetings.

COLLABORATION WITH THE COMMITTEE ON ENVIRONMENT AND NATURAL RESOURCES

CENR Principals. The Federal Coordinator continues to be a participant on the Committee on Environment and Natural Resources (CENR). There were a number of reports that required the Federal Coordinator's review and concurrence. These included: *Sustainability as a Cross-Cutting CENR Issue*, *U.S. Inputs into GEO Framework Draft for the Earth Observation System(s) (EOS)*, *Possible GEO and U.S. Process Outcomes*, Framework draft and Communique draft in anticipation of intergovernmental agreement at Tokyo Earth Observation Summit II, *Declaration on the Establishment of the Group on Earth Observations*, and draft *Strategic Plan for the U.S. Integrated Earth Observation System*.

Subcommittee on Disaster Reduction. OFCM has been an active participant in the work of the CENR Subcommittee on Disaster Reduction (SDR). Recognizing that disasters can be the result of a technological and/or natural hazard, the subcommittee changed its name from the Subcommittee on Natural Disaster Reduction to the SDR. Recently, the focus of this group has been to define its strategic vision in coordination with the White House Office of Science and

Technology Policy and the Office of Homeland Security. Through OFCM representation on the SDR, OFCM has helped craft the subcommittee's charter and annual operations plan. The major thrusts of these documents are to (1) promote effective strategies for reducing national vulnerability to disaster risks and losses by leveraging expertise and information across the Federal government, and (2) establish focused outreach to the academic and private communities. OFCM is committed to working with SDR to provide a forum for information sharing, development of collaborative opportunities, and interactive dialogue with the U.S. policy community to advance informed strategies for managing risks associated with natural and technological disasters. To achieve these goals and to support communication of high priority, national programs for disaster reduction and recovery, OFCM representation on SDR helped draft an annual report that presents an overview of current, national disaster programs, and an identification of high priority needs and opportunities. The report will contribute to U.S. government planning activities on a number of levels and is intended as a supplement to the President's budget.

AMERICAN METEOROLOGICAL SOCIETY (AMS)

During FY 2004, OFCM joined leading environmental science and service corporations in supporting undergraduate scholarships in the atmospheric and related oceanic and hydrologic sciences. The scholarships, awarded for the junior and senior years, are designed to encourage outstanding undergraduates to pursue careers in the fields covered by the awards. OFCM plans to continue this support. OFCM also supports AMS endeavors by participating in AMS conferences and workshops and other environmental science education and outreach programs. OFCM staff, as co-chair of the

AMS Weather Analysis and Forecasting Conference in January 2004, at the Annual AMS meeting, coordinated a special session on the Weather Research and Forecast (WRF) system. This provided the weather community with a current update on program plans and the ongoing science involved in the system. WRF is due for operational implementation in FY 2005. In addition, OFCM staff will chair the next AMS Weather and Forecasting Conference to be held in the Washington, D.C., area in August 2005. The focus for this conference will be *Educating and Training the User Community and the Public on Weather Analysis and Forecasting*.

PUBLICATIONS AND OFCM'S WEB SITE

The following publications were prepared in hardcopy form and/or have been placed on OFCM's Web site (www.ofcm.gov):

- *The Federal Plan for Meteorological Services and Supporting Research-Fiscal Year 2004*

- *Aviation Weather Programs/Projects (Tier 3/4 Baseline Update)*

- *Urban Meteorology-Meeting Weather Needs in the Urban Community*

- *National Hurricane Operations Plan*

- *Federal Meteorological Handbook No. 11-Doppler Radar Meteorological Observations; Part A-System Concepts, Responsibilities and Procedures*

- *Catastrophic Backup Action Plan*

The following documents are planned for publication during FY 2005:

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- *The Federal Plan for Meteorological Services and Supporting Research-Fiscal Year 2005*
 - *Federal Atmospheric Transport and Diffusion Research and Development Plan*
 - *Homeland Security Environmental Support Plan*
 - *Proceedings of the 2nd International Conference on Volcanic Ash and Aviation Safety*
 - *Proceedings of the User Forum on Urban Meteorology*
 - *National Hurricane Operations Plan*
 - *Federal Meteorological Handbook No. 11-Doppler Radar Meteorological Observations; Part B-Doppler Radar Theory and Meteorology*
 - *Federal Meteorological Handbook No. 11-Doppler Radar Meteorological Observations; Part C-WSR-88D Products and Algorithms*
 - *Federal Meteorological Handbook No. 11-Doppler Radar Meteorological Observations; Part D-WSR-88D Unit Description and Operational Analysis*
 - *Federal Meteorological Handbook No. 12-United States Meteorological Codes and Coding Practices*
- During FY 2004, OFCM continued to make substantial progress on its use of the Internet. In addition to information about the office, OFCM has placed its current publications on its Web site, and keeps the Web site current with information regarding workshops and forums being conducted by the office. OFCM will continue to make information available on the Internet during FY 2005.

Table A.1 Current OFCM Publications

<u>Publication Title</u>	<u>Date</u>	<u>Number</u>
<i>Federal Plan for Meteorological Services and Supporting Research, Fiscal Year 2004</i>	October 2003	FCM-P1-2003
<i>Urban Meteorology: Meeting Weather Needs in the Urban Community</i>	January 2004	FCM-R22-2004
National Plan for Space Environment Services and Supporting Research: 1993-1997	August 1993	FCM-P10-1993
<i>National Severe Local Storms Operations Plan</i>	May 2001	FCM-P11-2001
<i>National Hurricane Operations Plan</i>	May 2004	FCM-P12-2004
<i>WSR-88D Tropical Cyclone Operations Plan</i>		
<i>National Winter Storms Operations Plan</i>	December 2003	FCM-P13-2003
Federal Plan for Cooperative Support and Backup Among Operational Processing Centers	Nov 2002	FCM-P14-2002
National Plan for Stratospheric Monitoring, 1988-1997	July 1989	FCM-P17-1989
National Aircraft Icing Technology Plan	April 1986	FCM-P20-1986
National Plan to Improve Aircraft Icing Forecasts	July 1986	FCM-P21-1986
Federal Plan for the Coordination of Automated Weather Information System Programs	May 1988	FCM-P23-1988
Federal Plan for Meteorological Information Management	July 1991	FCM-P24-1991
<i>National Plan for Tropical Cyclone Research and Reconnaissance (1997-2002)</i>	January 1997	FCM-P25-1997
National Aviation Weather Program Plan	September 1992	FCM-P27-1992
National Geostationary Operational Environmental Satellite (GOES) Data Collection System (DCS) Operations Plan	August 1997	FCM-P28-1997
Federal Plan for Marine Environmental Data, Services, and Supporting Research	June 1996	FCM-P29-1996
<i>The National Space Weather Program: Strategic Plan</i>	August 1995	FCM-P30-1995
<i>The National Space Weather Program: Implementation Plan - 2nd Edition</i>	July 2000	FCM-P31-2000
<i>National Aviation Weather Strategic Plan</i>	April 1997	FCM-P32-1997
<i>National Post-Storm Data Acquisition Plan</i>	March 2003	FCM-P33-2003
<i>National Aviation Weather Initiatives</i>	February 1999	FCM-P34-1999
National Aviation Weather Initiatives, Final Baseline Tier 3 and 4 Report	April 2001	
<i>National Aviation Weather Program/Projects (Tier 3/4 Baseline Update)</i>	December 2003	FCM-R21-2003
<i>Federal Meteorological Handbook No. 1 - Surface Weather Observations and Reports</i>	December 1995	FCM-H1-1995
Federal Meteorological Handbook No. 2 - Surface Synoptic Codes	December 1988	FCM-H2-1988
Surface Synoptic Code Tables (Update)	July 1990	FCM-T1-1990
<i>Federal Meteorological Handbook No. 3 - Rawinsonde and Pibal Observations</i>	May 1997	FCM-H3-1997
Federal Meteorological Handbook No. 10 - Meteorological Rocket Observations	December 1988	FCM-H10-1988

Table A.1 Current OFCM Publications (cont.)

<u>Publication Title</u>	<u>Date</u>	<u>Number</u>
Federal Meteorological Handbook No. 11 - Doppler Radar Meteorological Observations		
<i>Part A - System Concepts, Responsibilities and Procedures</i>	June 2003	FCM-H11A-2003
Part B - Doppler Radar Theory and Meteorology	June 1990	FCM-H11B-1990
Part C - WSR-88D Products and Algorithms	February 1991	FCM-H11C-1991
Part D - WSR-88D Unit Description and Operational Analysis	April 1992	FCM-H11D-1992
<i>Federal Meteorological Handbook No. 12 - United States Meteorological Codes and Coding Practices</i>	<i>December 1998</i>	<i>FCM-H12-1998</i>
<i>Directory of Atmospheric Transport and Diffusion Consequence Assessment Models</i>	<i>March 1999</i>	<i>FCM-I3-1999</i>
<i>Federal Directory of Mobile Meteorological Equipment and Capabilities</i>	<i>December 1995</i>	<i>FCM-I5-1995</i>
<i>A Guide to WMO Code Form FM 94 BUFR</i>	<i>March 1995</i>	<i>FCM-I6-1995</i>
Tropical Cyclone Studies	December 1988	FCM-R11-1988
Tropical Cyclone Studies Supplement	August 1989	FCM-R11-1988S
<i>Interdepartmental Meteorological Data Exchange System Report, IMDES</i>	<i>August 1998</i>	<i>FCM-R12-1998</i>
Federal Meteorological Requirements 2000	October 1990	FCM-R13-1990
<i>U.S. Wind Profiler: A Review</i>	<i>March 1998</i>	<i>FCM-R14-1998</i>
Atmospheric Modeling of Releases from Weapons of Mass Destruction	August 2002	FCM-R17-2002
<i>Weather Information for Surface Transportation--National Needs Assessment Report</i>	<i>December 2002</i>	<i>FCM-R18-2002</i>
<i>Report on Wind Chill Temperature and Extreme Heat Indices: Evaluation and Improvement Projects</i>	<i>January 2003</i>	<i>FCM-R19-2003</i>
<i>National Aviation Weather Program Mid-Course Assessment</i>	<i>August 2003</i>	<i>FCN-R20-2003</i>
Standard Formats for Weather Data Exchange Among Automated Weather Information Systems	November 1994	FCM-S2-1994
Standard Telecommunication Procedures for Weather Data Exchange (under revision)	October 1991	FCM-S3-1991
<i>Federal Standard for Siting Meteorological Sensors at Airports</i>	<i>August 1994</i>	<i>FCM-S4-1994</i>
<i>Proceedings of the Workshop on Multiscale Atmospheric Dispersion Modeling within the Federal Community</i>	<i>June 2000</i>	
<i>Proceedings of the Aviation Weather User Forum--Aviation Weather: Opportunities for Implementation</i>	<i>July 2000</i>	
<i>Proceedings for the Symposium on Weather Information for Surface Transportation: Delivering Improved Safety and Efficiency for Tomorrow</i>	<i>February 2000</i>	
<i>Proceedings of the Symposium on Weather Information for Surface Transportation -- Preparing for the Future: Improved Weather Information for Decision Makers</i>	<i>March 2001</i>	
<i>Proceedings of the Forum on Risk Management and Assessment of Natural Hazards</i>	<i>July 2001</i>	
<i>Proceedings of the Workshop on Strategy for Providing Atmospheric Information</i>	<i>March 2002</i>	
<i>Aviation Weather Training: A Report on Training for Emerging and Recently Implemented Aviation Weather Programs</i>	<i>April 2002</i>	<i>FCM-R16-2002</i>
<i>Proceedings of the Workshop on Effective Emergency Response</i>	<i>May 2002</i>	

Italics = publication available online at www.ofcm.gov